

Assignment 1

Textbook Assignment: "Fluid Power," chapter 1; "Forces in Liquids," chapter 2; "Hydraulic Fluids, " chapter 3, pages 3-1 through 3-6.

Learning Objective: Recognize the scope of the text and the breadth of the topic, Fluid Power, including pertinent definitions, applications and fundamental concepts.		IN ANSWERING QUESTIONS 1-4 THROUGH 1-6, SELECT FROM COLUMN B THE SYSTEM THAT MEETS THE PRESSURE AND CONTROL REQUIREMENTS LISTED IN COLUMN A.	
		A. Requirements	B. Systems
1-1.	The term "fluid power" includes hydraulics and pneumatics, and is power that is applied through liquids or gases pumped or compressed to provide force and motion to mechanisms.	1-4. A medium amount of pressure and fairly accurate control	1. Hydraulic 2. Pneumatic
	1. True 2. False	1-5. A medium amount of pressure and more accurate control	3. Combination hydraulic and pneumatic
1-2.	The purpose of your textbook, Fluid Power, is to provide you with	1-6. A great amount of pressure and/or extremely accurate control	
	1. a basic guide for use in maintaining hydraulic equipment 2. a basic reference concerning fundamentals of fluid power 3. information on fluid power application for specific equipment 4. a reference concerning advanced concepts of fluid power		
1-3.	Which of the following is a favorable characteristic of a fluid power system?	1-7. Which of the following is a special problem of fluid power systems?	
	1. Very large forces can be controlled by much smaller ones 2. Different parts of the system can be located at widely separated points 3. Motion can be transmitted without the slack inherent in the use of solid machine parts 4. Each of the above	1. Loss in efficiency as the force of the fluid is conveyed up and down or around corners 2. Loss of force as the fluid is transmitted over considerable distances 3. Leaks 4. Each of the above	
		1-8. The study of hydraulics was originally confined to the study of the physical behavior of water at rest and in motion. The term "hydraulics" now includes the physical behavior of all	
		1. liquids 2. gases 3. liquids and gases 4. liquids, gases, and solids	

- 1-9. Pascal's law pertains to the
1. construction of aqueducts
 2. use of water wheels for doing work
 3. differences of floating and submerged bodies
 4. transmission of force in confined fluids

IN QUESTIONS 1-10 THROUGH 1-12, SELECT FROM COLUMN B THE TYPE OF POWER USED IN EACH ITEM OF EQUIPMENT OR SYSTEM LISTED IN COLUMN A.

	<u>A. EQUIPMENT</u>	<u>B. POWER TYPES</u>
1-10.	Dental Chair	1. Hydraulic
1-11.	Anchor Windlass	2. Hydro-pneumatic
1-12.	Service station lift	3. Pneumatic

Learning Objective: Identify the states of matter and the factors affecting them.

- 1-13. All matter is classified according to its state as a solid, a liquid, or a gas.
1. True
 2. False
- 1-14. The critical factors affecting the state of matter are
1. temperature and weight
 2. pressure and density
 3. density and specific gravity
 4. pressure and temperature

Learning Objective: Recognize the pressure characteristics of liquids, including how pressure is caused by the weight of the atmosphere, and identify how pressures are measured.

- 1-15. Pressure can be measured in terms of force per unit area.
1. True
 2. False

1-16. Mark each of the following statements, concerning the atmosphere and atmospheric pressure, true or false; then select the alternative below that lists the statements that are true.

- A. The troposphere is that part of the atmosphere touching the earth's surface
- B. The atmosphere has weight.
- C. Atmospheric pressure decreases as altitude decreases.
- D. Atmospheric pressure at points below sea level is less than at sea level.

1. A and B
2. B and C
3. C and D
4. A, B, C, and D

1-17. The reference standard used as an indicator of atmospheric pressure is a column of mercury that at sea level is

1. 76 inches high at 0°C
2. 76 centimeters high at 4°C
3. 76 centimeters high at 0°C
4. 29.92 inches high at 4°C

1-18. The side of a thin-walled chamber partially evacuated of air is the source of movement for the

1. hydrometer
2. aneroid barometer
3. mercury thermometer
4. Fahrenheit thermometer

Learning Objective: Identify terms and facts applicable to the physics of fluids and use these facts with related formulas to solve problems pertaining to density and specific gravity.

1-19. In the metric system the density of a substance is its weight in

1. grams per cubic foot
2. pounds per cubic foot
3. grams per cubic centimeter
4. pounds per cubic centimeter

- 1-20. What change, if any, will occur in the volume and weight of a substance if its temperature changes?
1. Both its volume and weight will change
 2. Both its volume and weight will be unaffected
 3. Its volume will change, but its weight will remain constant
 4. Its weight will change, but its volume will remain constant
- 1-21. Which statement about specific gravity is false?
1. The density of a solid can be determined by multiplying its specific gravity times the density of water
 2. Specific gravity can also be described as specific weight or specific density
 3. Specific gravity of a substance should be measured at a standardized temperature and pressure
 4. Specific gravity will vary with the size of the sample being tested
- 1-22. How can the specific gravity of a liquid or solid be expressed?
1. As a ratio between the weight of the substance and the density of a volume of water
 2. As a ratio between the weight of the substance and the weight of an equal volume of water
 3. As the number that shows the density of the substance in the metric system
 4. As in 2 and 3 above
- 1-23. What is the specific gravity of a liquid which weighs 44 pounds per cubic foot at 4°C?
1. 0.440
 2. 0.624
 3. 0.705
 4. 0.789

- 1-24. What is the density of a solid that has a specific gravity of 2.5?
1. 156 pounds per cubic foot
 2. 250 pounds per cubic foot
 3. 312 pounds per cubic foot
 4. 482 pounds per cubic foot
- 1-25. What is the specific gravity of a solid object which weighs 49.92 pounds per cubic foot?
1. 0.789
 2. 0.8
 3. 2.7
 4. 0.9
- 1-26. A device used for measuring the specific gravity of a liquid is known as a
1. hydrography
 2. hydrometer
 3. hydrostat
 4. hydroscope
-
- Learning Objective: Recognize the principles and equations involved with the transmission of forces, and solve related problems.
-
- 1-27. The pressure of force exerted on the end of a rigid metal bar is applied equally and undiminished to all surfaces of the bar.
1. True
 2. False
- 1-28. The head, or pressure due to the weight of a fluid, depends on the density of the fluid and the
1. area of the bottom surface of the container
 2. total volume of the fluid
 3. vertical height of the fluid
 4. geometric shape of the container

REFER TO FIGURE 2-11 OF YOUR TEXTBOOK IN ANSWERING QUESTIONS 1-29 AND 1-30, WHICH DEAL WITH THE MULTIPLICATION OF FORCES IN POWER SYSTEMS.

1-29. Assume that the input piston has an area of 3 square inches with a force of 45 pounds. What is the pressure in the system?

1. 5 psi
2. 10 psi
3. 15 psi
4. 20 psi

1-30. Assume that the output piston has a diameter of 6 inches and is subject to a pressure of 10 pounds per square inch. What is the force exerted on the output piston?

1. 28.26 pounds
2. 31.4 pounds
3. 282.6 pounds
4. 314.0 pounds

Refer to figure 1A in answering questions 1-31 and 1-32. The rule applying to the action of the piston states that the force acting on the piston surface area from chamber C is proportional to the pressure in chamber C times the area of the piston head. The force acting on the piston from chamber D is proportional to the pressure in chamber D times the effective area of the piston head (which is the cross-sectional area of the piston minus the cross-sectional area of the piston shaft.) The piston surface in chamber C is 25 square inches, and the effective area in chamber D is 20 square inches.

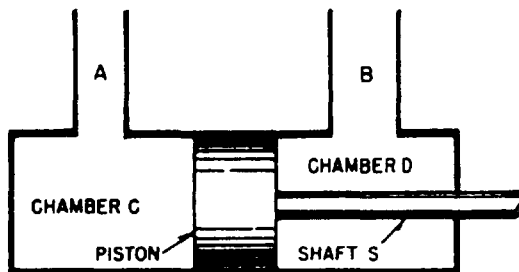


Figure 1A

1-31. The pressure in line A is 200 psi. No force is exerted on shaft S. How much pressure will be required in line B to prevent the piston from moving?

1. 160 psi
2. 200 psi
3. 250 psi
4. 500 psi

1-32. Lines A and B are pressurized to 50 psi. How much force is applied to each surface and which way will the piston move?

1. C = 1250 pounds, D = 1000 pounds, piston will move to the right
2. C = 1250 pounds, D = 1000 pounds, piston will move to the left
3. C = 1000 pounds, D = 1250 pounds, piston will move to the right
4. C = 1000 pounds, D = 1250 pounds, piston will move to the left

1-33. For two pistons in the same fluid power system, the distances moved are inversely proportional to the

1. pressure of the fluid
2. volume of fluid moved
3. expansion of the fluid
4. areas of the pistons

Learning Objective: Recognize the characteristics and behavior of fluids in motion, including methods for measuring volume and velocity, and relate the dynamic and static factors involved with fluid flow.

1-34. In fluid power systems using liquids, the measurement of the volume of fluid flow is made in units of

1. cubic inches per minute
2. gallons per minute
3. cubic feet per minute
4. cubic yards per minute

1-35. Water flows through a pipe of 5 square-inch cross section at the velocity of 3 feet per second (fps). At what velocity does it flow through a constriction in the pipe with a cross section of 3 square inches?

1. 1.8 fps
2. 3.0 fps
3. 3.6 fps
4. 5.0 fps

1-36. Two pistons with different cross-sectional areas will travel at the same speed as long as the rate of fluid flow into their cylinders is identical.

1. True
2. False

1-37. In streamline flow, each particle of fluid moves in what manner?

1. In uniform helical swirls
2. In parallel layers
3. At a velocity proportional to the cross-sectional area of the pipe
4. At the same velocity in the center of the pipe as along the walls

1-38. Losses due to friction increase with velocity at a higher rate in turbulent flow than in streamline flow.

1. True
2. False

1-39. What is inertia of fluids in a power system?

1. The resistance of the fluid to movement or change of rate of movement
2. The force required to maintain the fluid at constant velocity
3. The capacity to move and change rate of flow
4. The force required to overcome friction

1-40. Neglecting friction, how much force is required to accelerate 3 pounds of fluid from rest to a velocity of 322 feet per second in 2 seconds?

1. 1.5 pounds
2. 3.0 pounds
3. 15 pounds
4. 30 pounds

ANSWER QUESTIONS 1-41 THROUGH 1-45 AS TRUE OR FALSE BASED ON THE RELATIONSHIP OF FORCE, PRESSURE, AND HEAD.

1-41. Head is a statement of force per unit area.

1. True
2. False

1-42. Velocity head is the loss of energy caused by inertia.

1. True
2. False

1-43. Gravity head depends on which portions of the system are exposed to open air.

1. True
2. False

1-44. Friction head cannot exist without velocity head.

1. True
2. False

1-45. There can be no static head if the fluid is in motion.

1. True
2. False

1-46. Which factors affecting fluid action are classified as static factors?

1. Applied forces, inertia, and friction
2. Atmospheric pressure, applied forces, and inertia
3. Gravity, applied forces, and friction
4. Gravity, atmospheric pressure, and applied forces

- 1-47. Refer to figure 2-18 in your textbook. If this were a practical situation, the pressure in chamber A would be greater than that in chamber B by the amount of pressure required to
1. absorb inertia
 2. prevent the fluid from moving
 3. overcome friction
 4. raise the pressure at an intermediate point

Learning Objective: Recognize similarities and differences between pneumatic and hydraulic fluid power systems, and indicate operating characteristics and component functions of basic fluid power systems.

- 1-48. The similarity between hydraulic and pneumatic fluid power systems is correctly indicated by which of the following statements?

1. The basic components of the systems are essentially the same
2. Both systems depend upon internal lubrication by the system fluid
3. Both 1 and 2 above correctly indicate the similarity
4. The basic components of the systems are identical and interchangeable

- 1-49. Which component of a hydraulic fluid power system performs the same function as the receiver in a pneumatic fluid power system?

1. Reservoir
2. Compressor
3. Actuator
4. Selector valve

Learning Objective: Identify the characteristic of liquid that makes it desirable for use in hydraulic systems and properties and characteristics that must be considered in selecting a hydraulic liquid for a particular system, including related data.

- 1-50. Liquids rather than gases are used in hydraulic systems because liquids are

1. more compressible
2. less compressible
3. more expensive
4. less corrosive to system components

- 1-51. A liquid that is satisfactory for use in a hydraulic system provides

1. a low viscosity index, good sealing quality, and lubricity
2. a high viscosity index, good sealing quality, and a low flashpoint
3. good lubrication and sealing qualities, and a viscosity that does not result in an increase in flow resistance in" system piping
4. good lubrication and a viscosity that decreases as temperature increases

- 1-52. The viscosity reading of a liquid is expressed as Saybolt universal seconds (SUS), which represents the time, in seconds, it takes for 60 cubic centimeters of the liquid at a specified temperature to pass through an orifice of given diameter.

1. True
2. False

- 1-53. A low V.I. indicates that a liquid will

1. maintain a constant viscosity over a wide temperature range
2. vary greatly in viscosity with changes in temperature
3. vary only slightly in viscosity with changes in temperature
4. have a response to temperature changes very much like the response of paraffinic oil

1-54. Which of the following statements is NOT a true statement of fluid viscosity?

1. An ideal fluid viscosity remains constant throughout temperature changes
2. The average hydraulic fluid has a relatively low viscosity
3. There is a large choice of liquids available for the viscosity range required
4. Liquids derived from the same source have equal resistance to heat

1-55. The film strength and lubricating qualities of a liquid are directly related to the liquid's physical properties.

1. True
2. False

1-56. Which statement about a hydraulic liquid that is continuously subjected to high temperature conditions is true?

1. It accumulates moisture
2. It changes unfavorably in composition
3. Its life is unaffected by the hours of use
4. The carbon and sludge formed in it are of little concern if the reservoir temperature remains normal

IN QUESTIONS 1-57 THROUGH 1-59, SELECT FROM COLUMN B THE DEFINITION OF EACH PROPERTY OF LIQUIDS LISTED IN COLUMN A.

	<u>A. Properties</u>	<u>B. Definitions</u>
1-57.	Fluidity	1. The internal resistance that tends to prevent liquids from flowing
1-58.	Viscosity	2. The quality, state, or degree of liquids being poisonous
1-59.	Chemical stability	3. The physical property that enables liquids to flow
		4. The ability of liquids to resist oxidation and deterioration for long periods

1-60. The desirable flashpoint of a hydraulic liquid is one which provides a

1. low degree of evaporation and good resistance to combustion
2. high degree of evaporation and poor resistance to combustion
3. low degree of evaporation and low resistance to combustion
4. high degree of evaporation and high resistance to combustion

1-61. Hydraulic liquid must possess which of the following properties?

1. Chemical stability and freedom from acidity
2. Lubricating ability and proper viscosity
3. Minimum toxicity and high flashpoint
4. All of the above

1-62. Although manufacturers strive to produce hydraulic liquids that contain no toxic chemicals, some liquids contain chemicals that are harmful. How do these poisonous chemicals enter the body?

1. Absorption through the skin
2. Through the eyes or mouth
3. Through inhalation
4. All of the above

Learning Objective: Recognize various types of hydraulic liquids and their particular characteristics and uses.

1-63. The bases of the most common types of hydraulic liquids are classified as

1. synthetic, water, or vegetable
2. water , petroleum, or synthetic
3. water , petroleum, or vegetable
4. petroleum, vegetable, or synthetic

1-64. What is the most widely used medium for hydraulic systems?

1. Petroleum-based liquid
2. Synthetic-based liquid
3. Vegetable-based liquid
4. Water-based liquid

1-65. Which of the following properties of a hydraulic liquid can be improved by additives?

1. viscosity
2. Chemical stability
3. Lubricating power
4. All of the above

1-66. The fluid currently being used in a hydraulic system that requires a nonflammable liquid will probably be a

1. synthetic-based liquid
2. blend of water and oil
3. petroleum-based liquid
4. blend of petroleum and vegetable oil

1-67. Which of the following statements is/are true concerning synthetic-based fluids?

1. They will not burn
2. They are compatible with most commonly used packing and gasket materials
3. They may contain toxic chemicals
4. All of the above

1-68. You have accidentally gotten a synthetic hydraulic fluid in your eyes . You should flush your eyes for at LEAST 15 minutes and seek immediate medical attention.

1. True
2. False

1-69. You are required to dispose of contaminated synthetic fluid while deployed. How should you dispose of the fluid?

1. Pump it to the collecting, holding, and transfer (CHT) tank
2. Place it in drums for disposal ashore
3. Pump it over the side
4. Dilute it with soapy water and pump it over the side

1-70. Water-based fluids' resistance to fire depends on the vaporization and smothering effect of steam generated from water.

1. True
2. False